Sampling Methods in Research

A complete lecture guide for selecting, evaluating, and reporting research samples

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Lecture Overview

What this session covers

By the end of the lecture, students will see sampling as a planned research decision rather than a simple recruitment task.

- Core concepts and terminology
- Major sampling methods
- Examples across disciplines
- Common mistakes and best practices
- Ethical issues and transparency

Learning Objectives

Measurable outcomes for students

1. Define population, sample, sampling frame, sampling unit, and representativeness.
2. Distinguish probability sampling from non-probability sampling.
3. Select an appropriate sampling method for common research scenarios.
4. Explain the strengths and limitations of each major sampling method.
5. Identify common sampling errors, biases, and ethical concerns.
6. Describe and justify a sampling strategy in a research proposal or thesis.

Introduction

Sampling as a foundation of credible research

Sampling is the planned selection of people, cases, events, records, or units from a larger population so that a study can answer its research question.

Why researchers sample

- A full census is often impossible or too costly.
- Sampling saves time while preserving analytical value.
- A well-designed sample supports valid conclusions.

Key idea

The quality of the sample often determines the quality of the evidence. A large sample is not automatically a good sample if it is biased or poorly selected.

Key Definitions

Core terms used in sampling

Term	Meaning in research	Simple example
Population	The full group about which the researcher wants to draw conclusions.	All undergraduate students at a university.
Sample	The selected subset of the population that provides data.	400 students who complete a survey.
Sampling frame	A practical list or source from which the sample is drawn.	Official student enrollment list.
Sampling unit	The individual element selected at each stage.	A student, classroom, household, hospital, or record.
Representativeness	The degree to which the sample reflects important population characteristics.	Similar gender, year level, and faculty distribution.

Background and Context

How sampling became central to research practice

- Early censuses attempted full population counts for taxation, planning, and governance.
- Modern survey research developed probability-based methods to estimate population characteristics from smaller groups.
- Qualitative research also uses sampling, but often to select information-rich cases rather than statistically representative cases.
- Today, sampling decisions are expected to be transparent, ethical, and aligned with the research purpose.

Main Concepts in Sampling

Decisions every researcher must make

Target population

Who or what the study is about

Accessible population

Who can realistically be reached

Inclusion criteria

Who qualifies for the study

Exclusion criteria

Who is intentionally not included

Sampling error

Difference caused by studying a sample instead of all cases

Sampling bias

Systematic distortion caused by the selection process

Types of Sampling Methods

The two broad families

Probability sampling

• Every unit has a known or calculable chance of selection.
• Uses random selection procedures.
• Often supports statistical generalization.
• Common in surveys, epidemiology, and policy studies.

Non-probability sampling

• Selection probability is unknown or not random.
• Participants are selected based on access, judgement, quotas, networks, or information value.
• Often used when populations are hard to list or when depth is more important than representation.
• Common in qualitative, exploratory, and applied studies.

Simple Random Sampling

Each unit has an equal chance of selection

How it works

1. Create a complete sampling frame.
2. Assign each unit an identification number.
3. Use a random number generator or lottery method.
4. Invite selected units to participate.

Example: randomly selecting 300 students from a university enrollment list.

Best when:

The population is well listed, relatively homogeneous, and random selection is practical.

Systematic Sampling

Select every kth unit after a random start

Formula idea: sampling interval k = population size N ÷ desired sample size n

1. List population
2. Choose sample size
3. Calculate k
4. Random start
5. Select every kth unit

Example

If N = 2,000 and n = 200, then k = 10. Select a random start from 1–10, then choose every 10th name.

Caution

Avoid systematic patterns in the list, such as seating charts or shift schedules that repeat in cycles.

Stratified Sampling

Ensure representation from important subgroups

Core logic

• Divide the population into strata based on key characteristics.
• Randomly sample within each stratum.
• Use proportional or equal allocation depending on the purpose.
• Useful when subgroup comparisons are important.

Examples of strata: gender, age group, year level, region, department, income group, hospital unit.

Year 1	randomly select within stratum
Year 2	randomly select within stratum
Year 3	randomly select within stratum
Year 4	randomly select within stratum

Population divided before selection

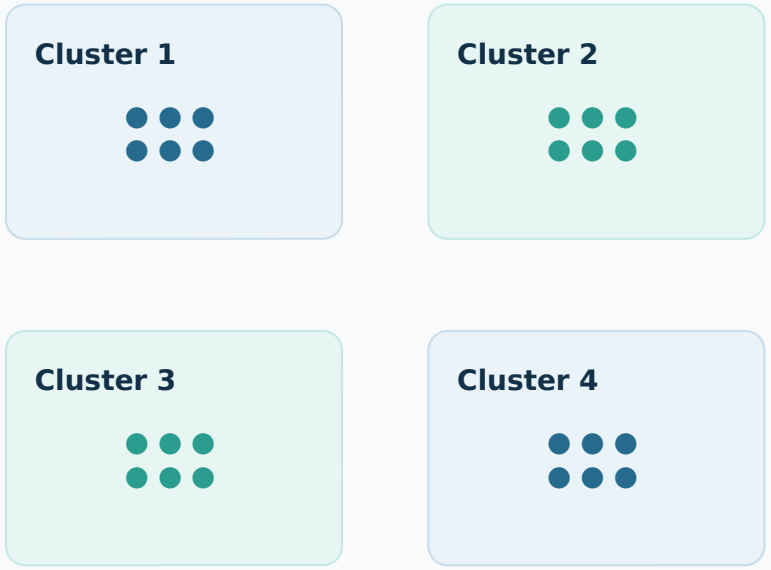
Cluster Sampling

Select groups first, then study units inside groups

Core logic

• Divide the population into naturally occurring groups or clusters.
• Randomly select clusters.
• Collect data from all units or a sample of units within selected clusters.
• Often used when a complete list of individuals is unavailable.

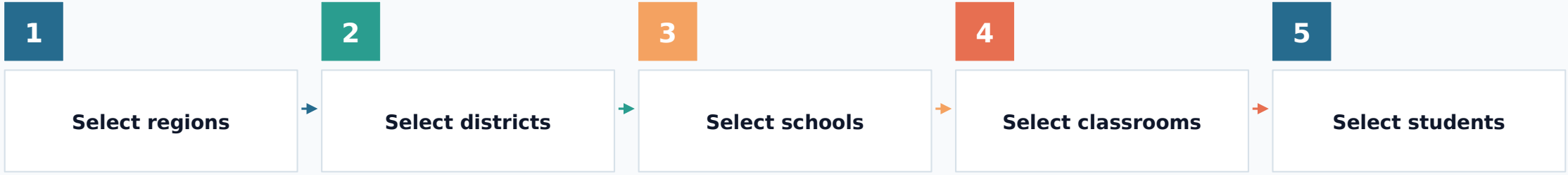
Examples of clusters: schools, villages, classes, hospitals, companies, neighborhoods.



Randomly select clusters, then sample within them

Multistage Sampling

Sampling in several linked stages



When useful

- Large populations spread across locations.
- No complete list of individuals exists.
- Fieldwork budget requires staged access.

Reporting requirement

Describe every stage, every selection rule, and every unit of analysis. A reader should be able to follow how the final participants were reached.

Non-probability Sampling Methods

Used when random selection is not feasible or not the goal

Convenience

Select available and accessible participants.

Purposive

Select information-rich or criterion-relevant cases.

Snowball

Use participant referrals to reach hidden networks.

Quota

Fill pre-set categories to reflect selected characteristics.

Non-probability samples should be justified by purpose, access, feasibility, or depth—not by convenience alone.

Convenience Sampling

Selecting participants who are easiest to reach

Typical use

• Pilot studies and classroom projects.
• Exploratory research where the goal is initial insight.
• Situations with limited time, budget, or access.

Example: surveying students who are present in a class because they are immediately accessible.

Main concern

• High risk of selection bias.
• Groups that are less visible may be missed.
• Findings should not be generalized broadly without caution.

Better wording: “The study used convenience sampling due to access constraints; therefore, findings should be interpreted as context-specific.”

Purposive Sampling

Selecting cases because they meet a meaningful purpose

Purposive sampling is common in qualitative research, expert studies, case studies, and exploratory work.

Criterion

Cases meet specific conditions.

Maximum variation

Cases represent diverse experiences.

Typical case

Cases reflect an ordinary example.

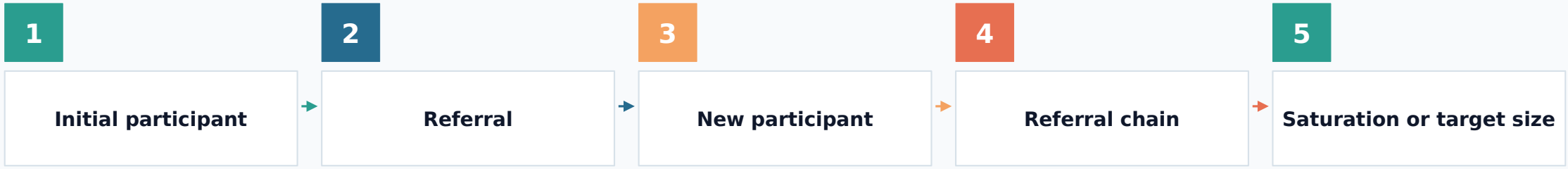
Expert

Participants have specialized knowledge.

Example: interviewing teachers with at least five years of experience using digital learning platforms.

Snowball Sampling

Using referrals to reach hidden or hard-to-access populations



Appropriate when

- The population is difficult to identify publicly.
- Trust and social networks are important for access.
- The study explores sensitive or specialized communities.

Ethical caution

- Avoid pressuring referrals.
- Protect privacy of both referrers and referred people.
- Do not reveal identities within the network.

Quota Sampling

Fill pre-set categories without random selection

How it works

1. Choose important categories.
2. Set target numbers for each category.
3. Recruit accessible participants until each quota is filled.
4. Report the quota variables and recruitment process.

Example: recruiting 50 men and 50 women for a consumer preference study.

Category	Quota	Filled
Men	50	50
Women	50	50
Age 18–24	40	40
Age 25–34	60	60

Quota sampling improves visible balance but does not create random selection.

Sample Size and Representativeness

Large is not always better—appropriate is better

Sample size depends on:

- Research design and purpose
- Population variability
- Desired precision or power
- Expected response rate
- Available time, budget, and access
- Analysis plan and subgroup comparisons

Representativeness depends on:

- Quality of the sampling frame
- Appropriate selection method
- Coverage of important subgroups
- Low nonresponse bias
- Transparent inclusion and exclusion criteria

A sample of 200 selected carefully may be stronger than a sample of 2,000 selected with serious bias.

Step-by-Step Sampling Process

A practical workflow for student researchers

1. Link the sample to the research question.
2. Decide whether generalization, comparison, or depth is the main purpose.
3. Choose probability sampling when population estimates are required and random selection is feasible.
4. Choose non-probability sampling when access, expertise, or depth is the main concern.
5. Document recruitment, nonresponse, replacements, and final participant numbers.

Practical Examples Across Disciplines

How sampling choices change by field and purpose

Discipline	Example study	Possible sample	Likely method
Social sciences	Voting attitudes of young adults	Young voters from selected districts	Stratified or cluster sampling
Business	Customer satisfaction with an online store	Recent customers from transaction records	Systematic or random sampling
Education	Teacher use of AI tools	Teachers with classroom experience	Purposive or stratified sampling
Health sciences	Patient adherence to medication	Patients at selected clinics	Cluster or systematic sampling
Psychology	Coping strategies after stress	Participants meeting screening criteria	Purposive or convenience sampling
Information technology	User experience of an app	Active users or beta testers	Quota or purposive sampling

Research Example: Applying Sampling

A complete scenario for classroom discussion

Element	Scenario details
Research topic	Use of AI writing tools among university students.
Research problem	Universities need evidence about how students use AI tools and whether usage differs by academic level.
Research question	How frequently do undergraduate and postgraduate students use AI writing tools for academic tasks?
Population	All enrolled students at one university during the academic year.
Sampling strategy	Stratified random sampling by academic level: undergraduate, master’s, and PhD.
Data collection	Anonymous online questionnaire distributed to selected students.
Data analysis	Descriptive statistics and comparison of usage patterns across strata.
Expected interpretation	Findings can describe the university population if the frame is accurate and response bias is addressed.

Advantages of Good Sampling

Why sampling improves research quality

Efficiency

Reduces cost and time compared with studying everyone.

Feasibility

Makes large or dispersed populations manageable.

Precision

Probability designs allow estimates of sampling error.

Subgroup insight

Stratified designs support comparisons across important groups.

Depth

Purposive sampling can select rich, relevant cases.

Ethical focus

Limits unnecessary data collection from people who are not needed for the study.

Limitations and Challenges

Problems that researchers must anticipate

Common limitations

- Incomplete or outdated sampling frames.
- Nonresponse or refusal to participate.
- Hidden selection bias in recruitment.
- High cost of random sampling in dispersed populations.
- Limited generalizability in many non-probability designs.

How to respond

- Define the accessible population honestly.
- Use reminders and accessible recruitment channels.
- Compare respondents and nonrespondents when possible.
- Report limitations clearly instead of hiding them.

Limitations are not failures when they are anticipated, minimized, and reported transparently.

Common Mistakes

Errors made by beginning researchers

- Calling a convenience sample “random” because participants were chosen without a plan.
- Describing the population too broadly when the sample is drawn from one accessible site.
- Using a large sample but ignoring selection bias and nonresponse.
- Failing to state inclusion and exclusion criteria.
- Choosing a method because it sounds advanced rather than because it fits the research question.
- Reporting only the final sample size without explaining recruitment and response rates.
- Ignoring ethical concerns when recruiting through personal networks or institutions.

Best Practices for Sampling

Practical recommendations for reliable research

Before data collection

- Define the target and accessible populations.
- Identify the best available sampling frame.
- Choose a method aligned with the research question.
- Justify sample size and subgroup needs.
- Prepare recruitment and consent materials.

During and after collection

- Track invitations, refusals, and completed responses.
- Avoid replacing nonrespondents without a clear rule.
- Protect privacy during recruitment.
- Report limitations, exclusions, and final sample characteristics.
- Use cautious language when generalizing.

Comparison Table

Sampling methods at a glance

Method	Selection basis	Best use	Key limitation
Simple random	Random selection from a complete list	General population estimates	Requires accurate frame
Systematic	Every kth unit after random start	Ordered lists without periodic patterns	Risk of list periodicity
Stratified	Random within subgroups	Subgroup representation and comparison	Requires subgroup information
Cluster	Randomly selected groups	Geographically dispersed populations	Higher sampling error possible
Convenience	Easy access	Pilot or exploratory studies	High selection bias
Purposive	Criteria or information richness	Qualitative and expert studies	Limited statistical generalization
Snowball	Participant referrals	Hidden populations	Network bias and privacy risk
Quota	Pre-set category targets	Balanced non-random recruitment	Not fully random

Ethical Considerations

Sampling decisions affect people, privacy, and fairness

Informed consent

Participants should understand why they were invited and what participation involves.

Privacy

Sampling frames may contain personal data and must be protected.

Fairness

Avoid unjustified exclusion of groups affected by the research topic.

Gatekeepers

Institutional access should not pressure people to participate.

Bias transparency

Report recruitment limits and possible underrepresentation.

Confidentiality

Protect identities, especially in small or networked populations.

Activity: Choose a Sampling Strategy

Individual or group exercise for instructors

Activity objective

Practice selecting and justifying a sampling method for a research problem.

Instructions

1. Select one study topic.
2. Define the population.
3. Choose a sampling method.
4. Explain why it fits.
5. Identify one limitation.

Expected outcome

Each group presents a concise sampling plan with method, population, sample size logic, recruitment source, and limitation.

Suggested topics: student mental health, online shopping behavior, teacher AI adoption, patient appointment satisfaction, or app usability.

Discussion Questions

Use these prompts for classroom conversation

1. When is a non-probability sample more appropriate than a probability sample?
2. How can nonresponse bias affect a survey even when the initial sample is random?
3. Why is a sampling frame important for probability sampling?
4. What makes a sample representative, and what does not?
5. How should researchers report limitations of convenience sampling?
6. How can ethical issues arise during snowball sampling?
7. What sampling method would you choose for a national student survey, and why?

Knowledge Check

Multiple-choice and short-answer questions

1. What is the difference between a population and a sample?
2. Which method randomly selects every kth unit after a random start?
3. In which method are subgroups created before random selection within each subgroup?
4. Which sampling method is often used for hidden populations?
5. What is one weakness of convenience sampling?
6. Why is a sampling frame necessary?
7. What is the main difference between stratified and quota sampling?
8. Name one ethical issue related to recruitment.

Answer Key

Suggested answers for the knowledge check

1. Population = full group of interest; sample = selected subset studied.
2. Systematic sampling.
3. Stratified sampling.
4. Snowball sampling.
5. Selection bias; limited generalization; overrepresentation of accessible participants.
6. It provides the list or source from which the sample is drawn.
7. Stratified sampling uses random selection within strata; quota sampling fills categories without random selection.
8. Consent, privacy, confidentiality, undue pressure, or unfair exclusion.

Key Takeaways and Conclusion

What students should remember

Key takeaways

- Sampling links a research question to real data.
- Probability methods support statistical generalization when random selection is possible.
- Non-probability methods are useful for access, depth, expertise, and exploratory work.
- Sample size matters, but bias and representativeness matter more.
- Ethical and transparent reporting strengthens research credibility.

Conclusion

A strong sampling strategy is not simply about reaching participants. It is about selecting the right units, from the right population, in a way that is ethical, transparent, and aligned with the purpose of the study.

In research writing, always explain who was sampled, how they were selected, why the method was appropriate, and what limitations remain.

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